

## Manufacturing Advanced Channel Wall Rocket Liners, Phase II

Completed Technology Project (2015 - 2019)



## Project Introduction

Liquid rocket developers have identified advanced engine concepts that are not feasible due to manufacture due to limitations in currently available technologies. Specifically, engine developers are in need of a manufacturing technology that is capable of generating cooling channels in liquid rocket nozzles and combustion chambers at low cost, while supporting increasingly complex designs (see appended letter of support from Aerojet Rocketdyne). This Phase II project will result in a reduced cost flexible technology that is ready to support the development and fabrication of advanced channel wall rocket liners and combustors. This will be achieved by adapting a novel manufacturing technology that can machine delicate and complex features in metals and ceramics. This technology was demonstrated to be feasible to support the advancement of channel rocket design by making more complex designs manufacturable while reducing lead time and manufacturing cost. It was shown to reduce machine time by 90% when compared to milling the same cooling channels in stainless steel. Advancing engine performance can be achieved through more optimal combustor and liner cooling, however engine designers are currently limited in what can be designed due to current technology slitting saw or end mill capabilities. The proposed technology overcomes this limitation and supports the design and fabrication of highly complex and delicate features. It can easily be scaled up to support SSME class engines. At the end of Phase II, this technology will be ready to support the development of and production of channel wall rockets that incorporate more complex cooling features than are currently feasible to manufacture. The technology will made more user friendly and efficient to implement, and a manufacturing workstation layout and cost will be developed to support both small and SSME class engines.



Manufacturing Advanced  
Channel Wall Rocket Liners,  
Phase II

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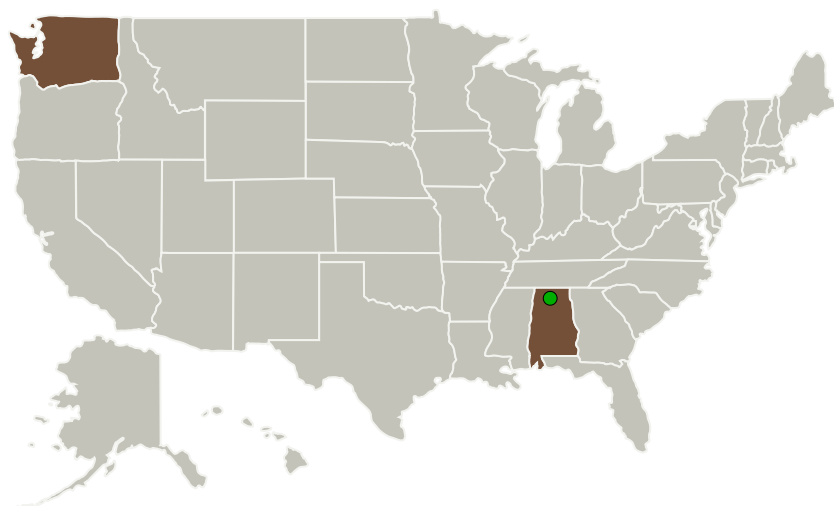
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## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work         | Role                    | Type        | Location            |
|---------------------------------------|-------------------------|-------------|---------------------|
| Ormond, LLC                           | Lead Organization       | Industry    | Auburn, Washington  |
| ● Marshall Space Flight Center (MSFC) | Supporting Organization | NASA Center | Huntsville, Alabama |

| Primary U.S. Work Locations |            |
|-----------------------------|------------|
| Alabama                     | Washington |

## Project Transitions

▶ **June 2015:** Project Start

✓ **March 2019:** Closed out

**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/137728>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Ormond, LLC

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

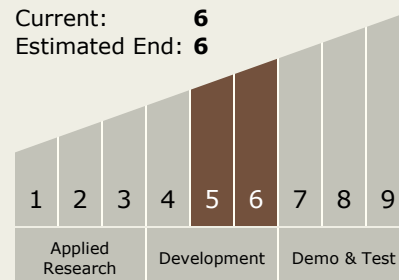
Carlos Torrez

**Principal Investigator:**

Daniel Alberts

## Technology Maturity (TRL)

Start: **5**  
Current: **6**  
Estimated End: **6**



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### Images



#### Briefing Chart

Manufacturing Advanced Channel  
Wall Rocket Liners Briefing Chart  
(<https://techport.nasa.gov/image/128868>)

### Technology Areas

#### Primary:

- TX01 Propulsion Systems
  - └ TX01.1 Chemical Space Propulsion
    - └ TX01.1.3 Cryogenic

### Target Destinations

The Moon, Mars, Outside the  
Solar System, The Sun, Earth,  
Others Inside the Solar System